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Title: A STUDY OF BROMINE CUSTOMER INFROMATION AND PACKAGING NEEDS

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2 - SR'191

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Center Number 10/24-6-R0499-0A0

Project Director BULLOCK, WILLIAM

Project Unit DEAN ARCH

Sponsor BIOLAB INCORPORATED/DECATUR, GA

Division Id 12766

Contract Number AGMT DTD 970615 Contract Entity GTRC

Prime Contract Number

Title A STUDY OF BROMINE CUSTOMER INFROMATION AND PACKAGING NEEDS

Effective Completion Date 31-DEC-1997 (Performance) 31-DEC-1997 (Reports)

Closeout Action:	Y/N	Date Submitted
Final Invoice or Copy of Final Invoice	Y	
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Classified Material Certificate	N	
Release and Assignment	N	
Other	N	

Comments

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Accounting	Y
Research Security Department	N
Reports Coordinator	Y
Research Property Team	Y
Supply Services Department/Procurement	Y
Georgia Tech Research Corporation	Y
Project File	Y

D-48-X71
#1

BIOLAB

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BioLab

EXECUTIVE SUMMARY

. During spring quarter 1997, students enrolled in a cross-disciplinary course of industrial design and marketing students offered through Georgia Tech's Collaborative Product Development Laboratory (CoLab), were charged with the task of improving current bromine packaging used by Great Lakes, Inc. The following report summarizes the team's efforts to design an improved or new bromine package.

Overall, the team recommends that Biolab consider the use of reusable packaging as a long-term solution. In the short-term, the team recommends that Biolab increase the size of the supersack, reduce the amount of corrugate in the current package, make the packaging more labor-effective, and consider using a corrugate pallet. Each of these recommendations and the associated designs are detailed in this report.

As a framework for evaluating disposable and reusable packaging concepts, the team identified two categories of issues pertinent to bromine packaging: (1) cost and (2) design and material processing. The cost category includes possible equipment costs, die costs, shipping costs, disposal costs, and overall total costs. Design and material processing includes size considerations, ease of use, materials, mold/die special requirements, labor, and special handling issues. All issues inherent to each category were carefully discussed by the team per each design. In addition, the team attempted to address the three unique sets of needs associated with bromine packaging, i.e., Biolab's needs (Great Lakes' needs), Biolab's customers (dealers') needs, and final end user needs. All discussion and considerations made by the team is given with each respective design.

BACKGROUND INFORMATION

Introduction

The following section presents background information pertinent to bromine packaging. Three topics are addressed: product life cycle, packaging redesign considerations, tracking considerations, and results of a distributor survey.

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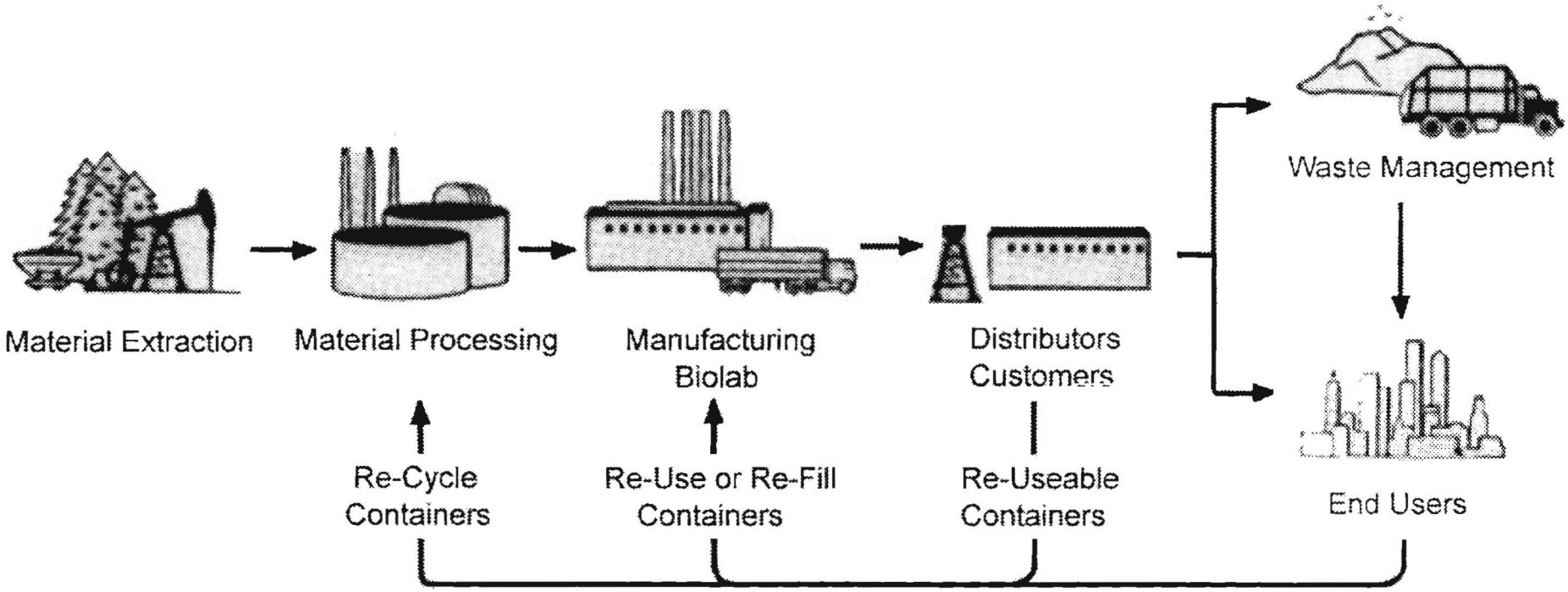
Product Life Cycle



Product Life Cycle

Concerns of costs and impact occur at all stages of a product's life cycle. Design can be employed to reduce these concerns by changing the amount and type of materials used in the product, by creating more efficient manufacturing operations, by reducing the energy and materials consumed during use, and by recovery of energy and materials during waste management. This diagram represents the Product Life Cycle (PLC). The diagram has been drawn to include BioLab's current system and incorporates an emerging cyclic approach. The material processing stage occurs at Great Lakes Corporation and the manufacturing stage occurs at Biolab. BioLab's customers then distribute the product to the end users. The end user then disposes the supersacks as hazardous material by means of waste management. Currently, packaging the product is a linear process: material extraction to waste management. Several concepts deal strictly with this process but improvements have been made through material and energy reduction. Several additional concepts were developed to enhance function and to incorporate the cyclic system approach of recycle and reuse where not only recovery of materials and energy occurs but material and energy reduction also play a key role in assessing cost effectiveness.

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Packaging Redesign and Tracking Considerations

Supersack Construction:

* Size
* Ease of Use
* Materials Reduction
* Mold/Die

Labor:

* Employee Training
* Material Cleaning
* Reuse

If reusable packaging is used, the following considerations will need to be made:

* Tracking of containers
* Container inventory
* Shipping
* Durability
* Return shipping
* Maintenance
* Container life

Distributors Survey

The following is a summary of results obtained from distributor surveys.
Ashland Drew Inc., Calgon, and Betz Dearborn Inc. were asked the following five questions:

1. How do you place your orders from Biolab?
2. How do you receive you receive your orders from Biolab? (Type of shipment)
3. In what form of packaging do you receive your order?
4. What form of Bromine do you receive in your order?
5. How many lbs. does a typical order contain?

The results indicate that all orders are placed by phone or fax. Calgon indicated specifically that most BCDMH orders are placed by fax and the NaBr orders are placed by phone. The mentioned distributors receive their orders in Supersacks, pails and tanktrucks. Tanktrucks are specifically used for NaBr. It is indicated that shipments are less than truckload, full truckload, and tanktruck quantities.

Ashland Drew Inc. receives tablets only and their typical BCDMH order with pails and supersacks is a full truckload, however, their orders with supersacks may be as small as 2,000 pounds.

Calgon indicates that their orders are in the form of tablets and granules. Their typical BCDMH order is between 1,800 and 3,600 pounds. These orders may be in supersacks or pails.

Betz Dearborn Inc. receives tablets and granules. Their BCDMH orders are full truckloads, 39,000 lbs. or more, but orders may be as small as 2,000 pounds.

Bio-Source Inc. places their orders by phone. These orders are received in the form of tablets shipped using the supersack. Bio-Source generally receives 2000 lbs. in each shipment. Third-party shipping is used to distribute Biolab's product to Bio-source's customers. Their customers are water treatment service companies, which receive the orders in pails ranging from single pail to multiple pallets.

None of the distributors who participated in this survey had any complaints regarding Biolab's packaging and shipping.

PRELIMINARY CONCEPTS

BioLab

Preliminary Concept 1

Current Packaging

- Reduction of Space
- Reduction of Cardboard
- Recyclability
- Cardboard Pallets
- Replacing Polypropylene Web
- "Juice Box" Concept
- Larger Supersack
- Reduction of Total Packaging Cost

Preliminary Concept 1

Cardboard Box
A key issue is the reduction of cardboard used for the current packaging. This will automatically reduce the total cost. It will also bring up the issue of utilizing the "dead space" within the current package. Utilizing this space will instantly allow for a lesser amount of cardboard to be used. Increasing the size of the Supersack will be taken into consideration when dealing with the reduction of cardboard issue.

Pallets
Pallets may be another issue in reducing the total cost of packaging. Various materials will be analyzed for their strength, durability and cost within the final development phase. Some of the research thus far suggests that the Air Force's use of corrugated cardboard pallets have been comparable to those of wooden pallets. A few of the key factors are listed below:

* Easy to handle -- no splinters, nails or staples needed
* Lightweight, weighing 1/3 to 1/4 less than wooden pallets
* Heavy duty, holding up to 1500 lbs.
* Nestable for compact storage
* Easily customized for any size up to 72"x72"
* 100% recyclable

The corrugated cardboard pallets may be made moisture resistant. The current cost per pallet is approximately $4.50 to $6.50, depending on the size and number of legs needed for each pallet.

Supersack
The supersack is currently made out of a polypropylene web. An investigation into replacing the polypropylene web with a "natural web," such as a "potato sack," will be dealt with during the final development phase. This "natural web" will be recyclable. Possible increase in size of the supersack (from 330 lbs. to 500 lbs.) will also be taken into consideration.

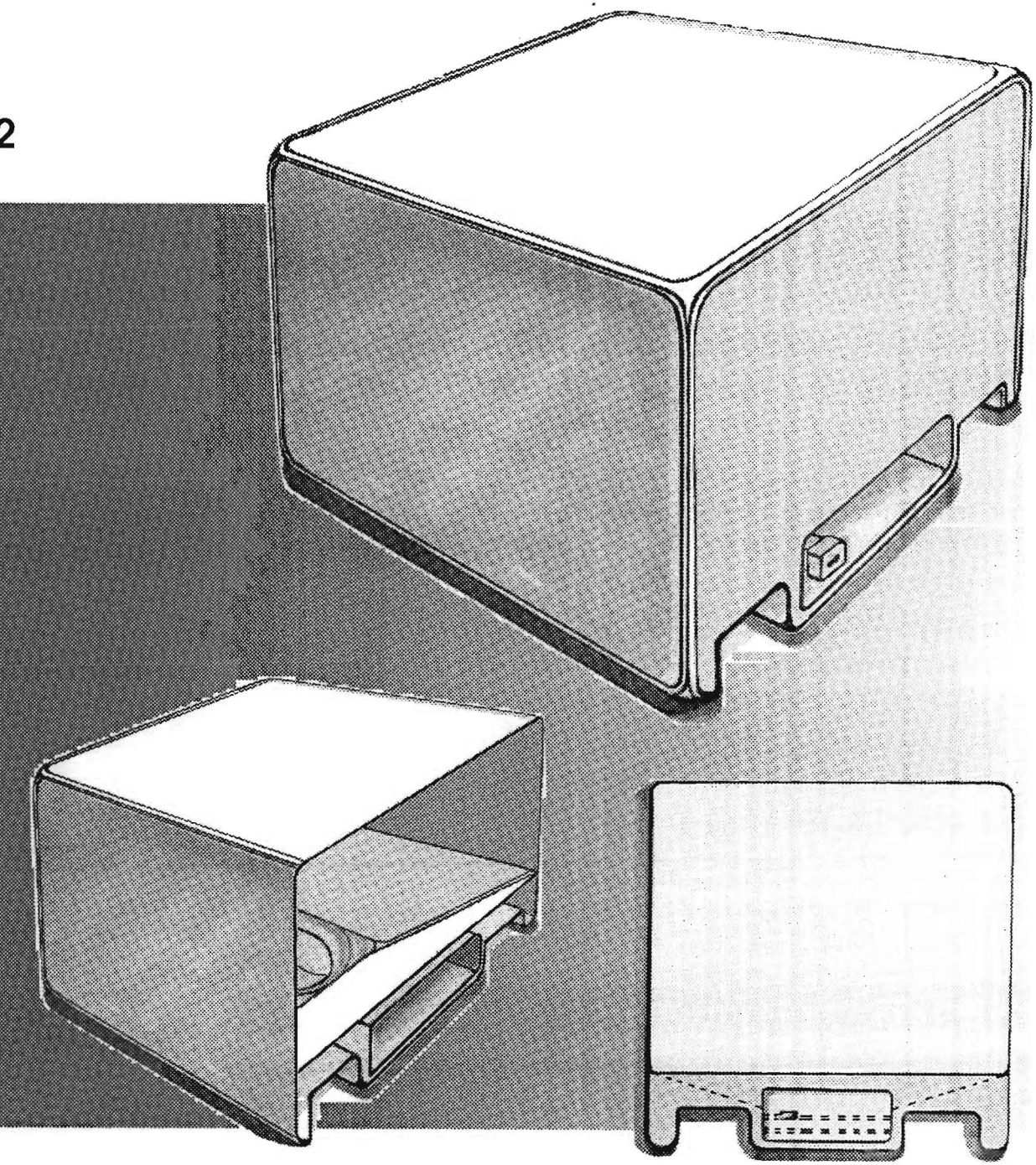
Package Design
A "juice box" concept may possibly be explored during the final development phase. This concept is based on a Juicy Juice drink box where the straw (the Brominator) punctures the drink box (the supersack), and the contents are free to pass through.

BioLab

Preliminary Concept 2

Reusable Container

- Integrated Pallet
- Valve & Lever
- Elimination of
  - Super Sack
  - Corrugated Box
  - Strap
- Poly Ethylene
- Rotation Molded
- Funnel Shaped Base



Preliminary Concept 2

The Reusable Container

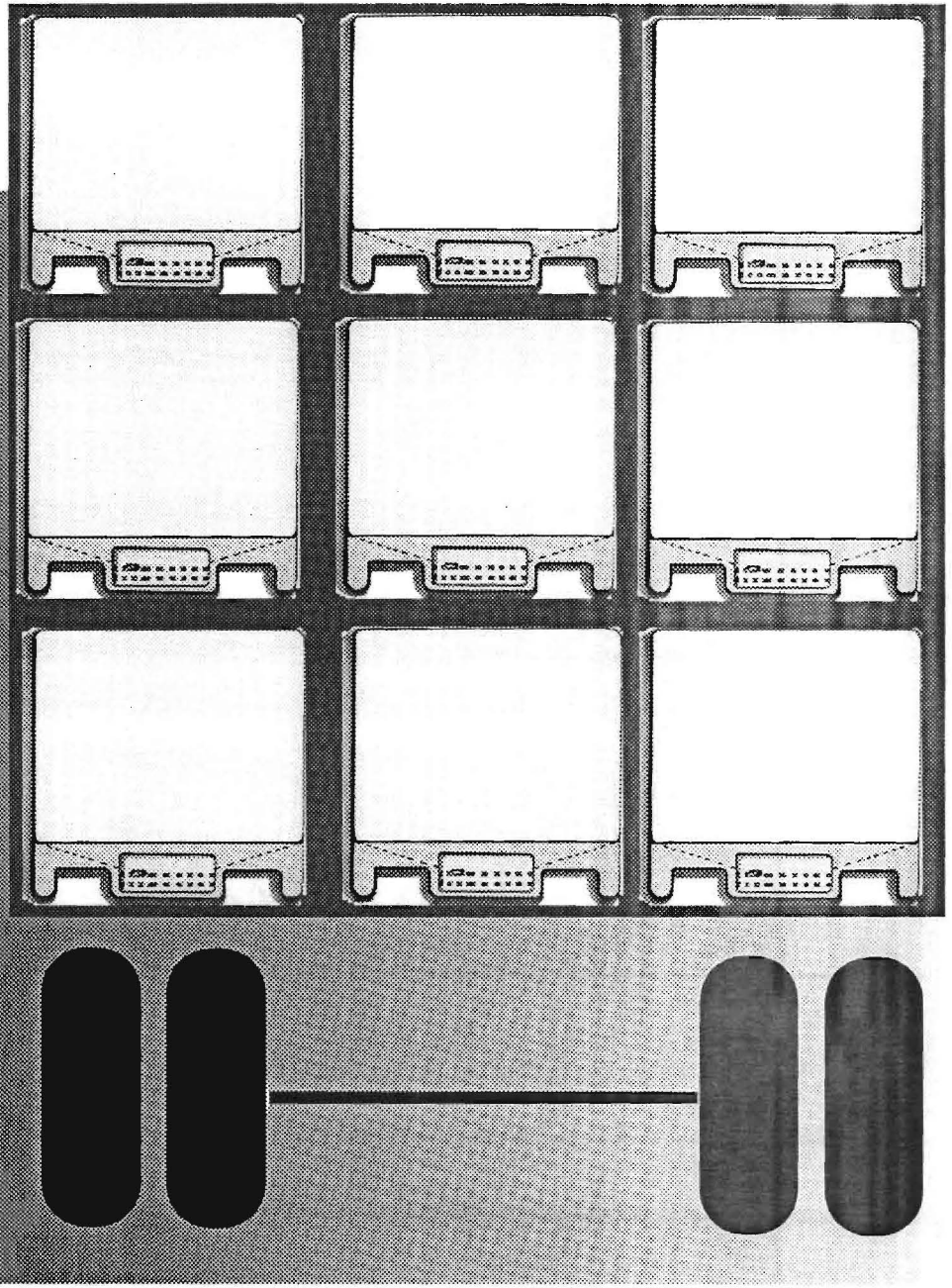
Of the many concept alternatives, the reusable concept may prove to be a viable long term solution. The packaging consists of a one piece rotation molded polyethylene container. The pallet is integrated into the container thus eliminating the super sack, corrugate box, and strap. An epoxy iris valve is required at the base to open and close the container and an air release nozzle is necessary on top to allow the material to flow when the valve is opened. As seen in the section views, the interior base is molded similar to a funnel so that the material may flow through the opening more freely.

BioLab

Preliminary Concept 2
(continued)

Benefits

- Re-Usable
- Ease of Use
- No Landfilling
- No Disposal Fees
- 5 - 9 Rule
- 39 Additional Shipped
  (3x3x13)



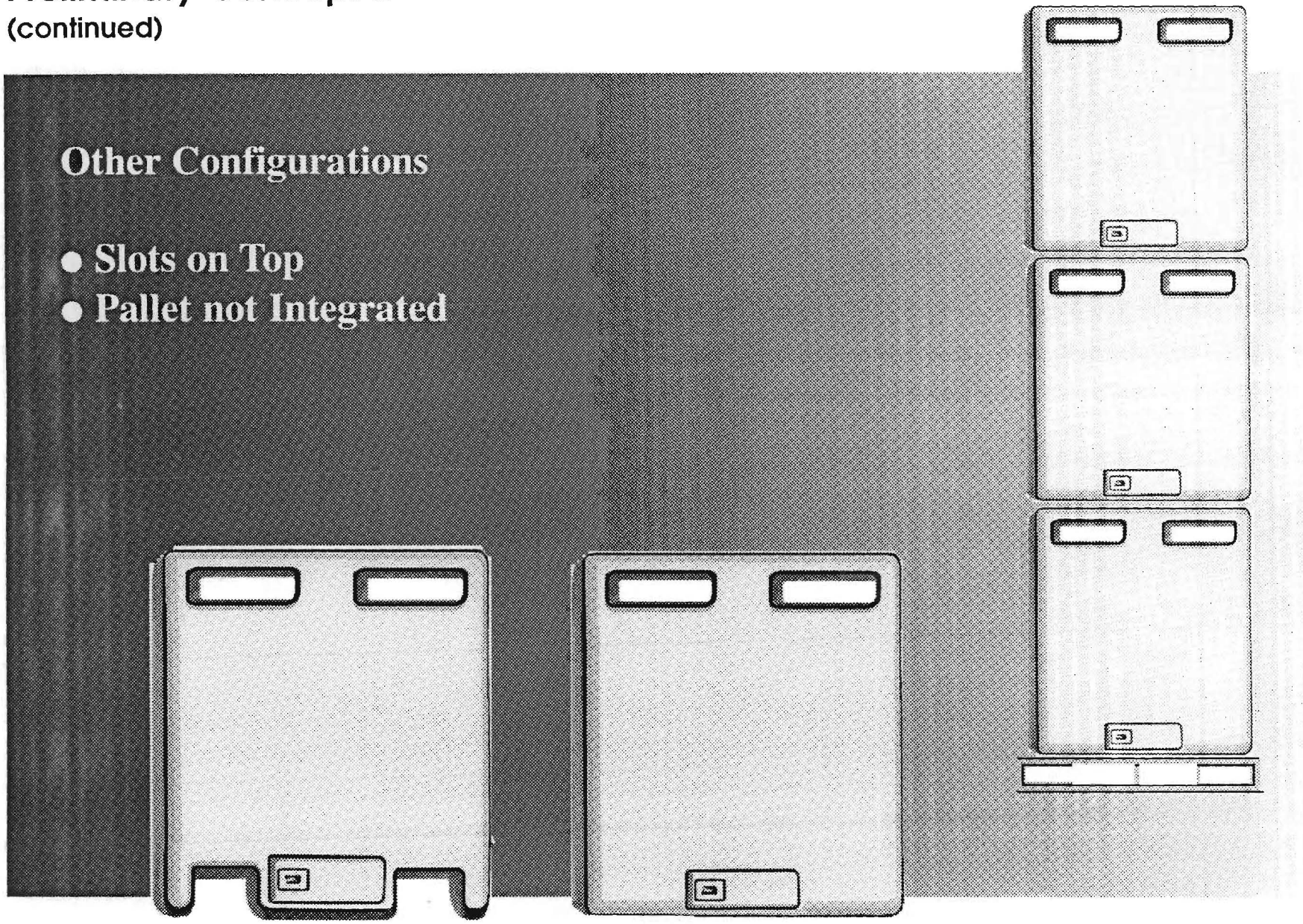
Preliminary Concept 2
(continued)

Benefits

Through using the reusable packaging, benefits for BioLab, BioLab's distributors, and end users exist. A few of the end user's benefits may be that there is no landfilling and no disposal fees. The integrated pallet and valve mechanism adds to its ease of use and may decrease labor time. The corrugate no longer needs to be opened, and the current super sack straps no longer need to be held up for the fork lift to slide in. BioLab's distributors also may benefit from ease of use when loading and unloading. Several benefits may also exist for Biolab. Due to eliminating the corrugate, the container width and length is decreased, thus allowing one more row of three wide and thirteen deep totaling thirty-nine more pallets on each shipment. Each container has a ridge molded into the top and bottom surface to assist in stacking appropriately. Due to the containers being reusable, purchasing pallets, corrugate, and straps are no longer necessary.

BioLab

Preliminary Concept 2
(continued)



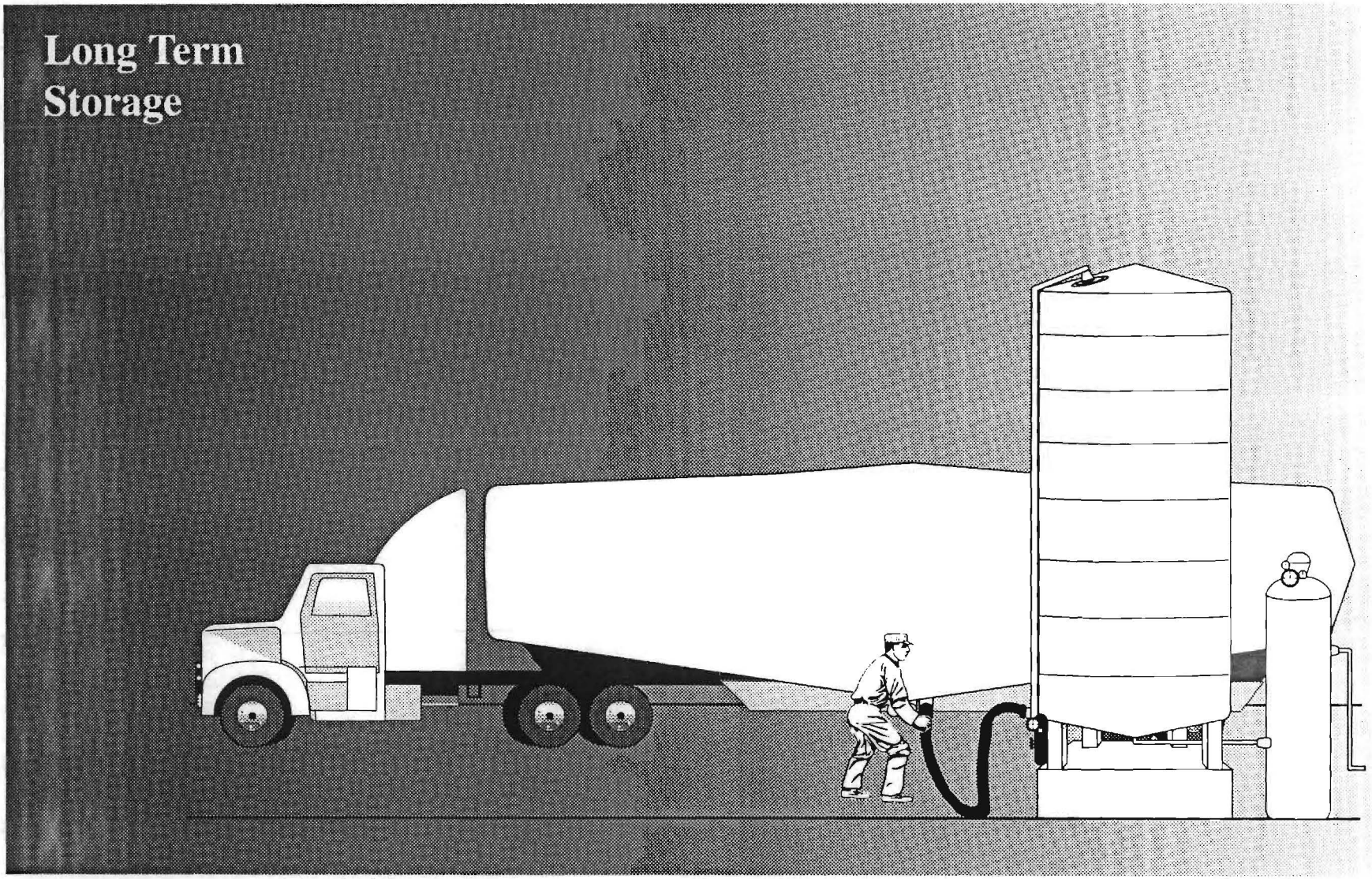
Preliminary Concept 2
(continued)

Other Configurations

Other configurations such as slots on top and elimination of the pallet may also assist in the ease of use and lowering of mold costs.

BioLab

Preliminary Concept 3



Preliminary Concept 3

Tanker Truck/ Silo Concept

The team developed this concept to explore long-term large storage capacities for consumers of bromine. The idea behind the concept is that the consumer can order large quantities of bromine, which would be filled on a month-to-month basis by a tanker truck. The team determined that this would be advantageous to the consumer because the consumer could regulate the amount of bromine they wished to use in a day as well as cut down on the labor of loading and dispensing the bromine into the brominator. The team further determined that this concept would be advantageous to Biolab because it would reduce the cost of packaging and the amount of shipping. The team reasearched the cost, advantages, and disadvantages of this concept, and concluded that although it would have a large start-up cost, in the long run, this concept could be a viable solution.

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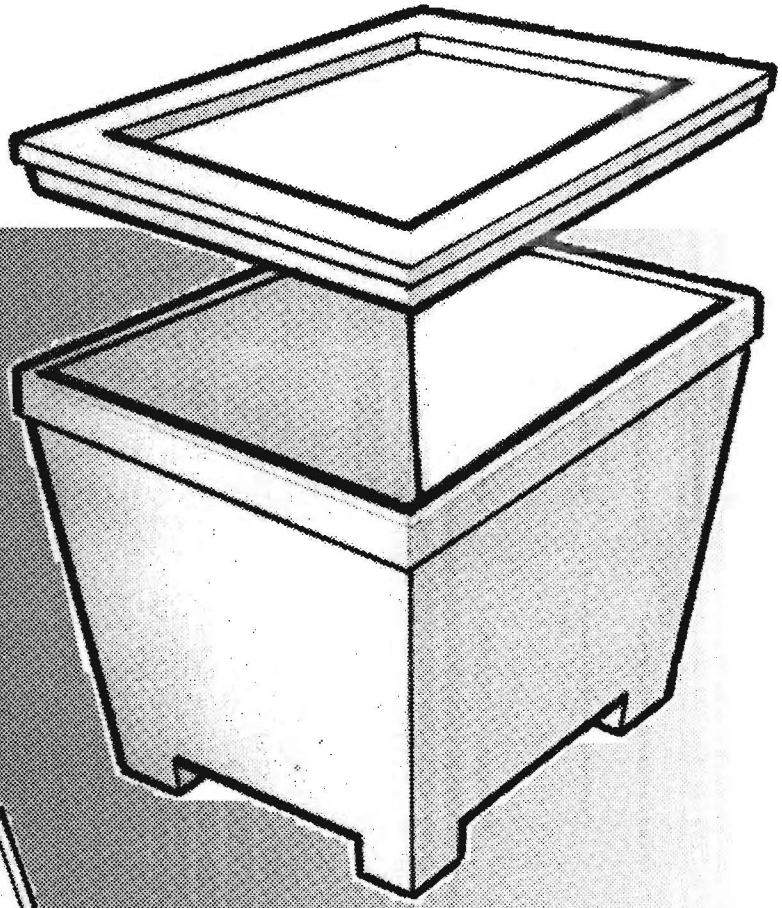
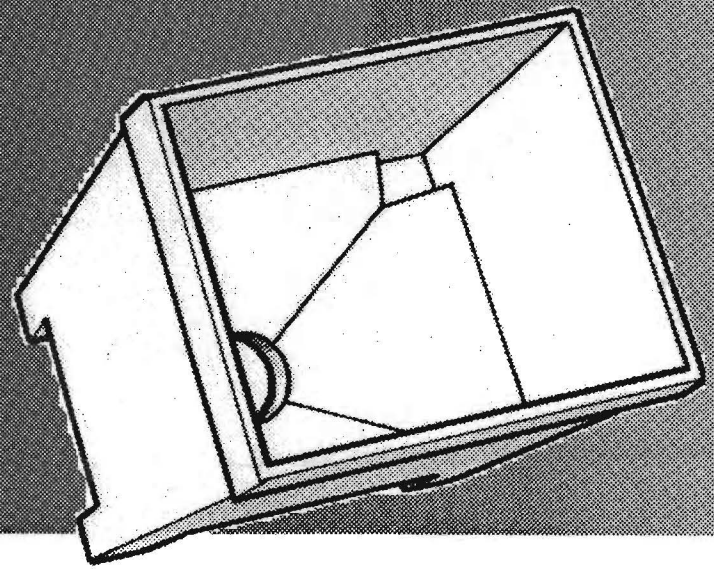
Preliminary Concept 4



Reusable / StackableContainer with PE liner

- **Rotation Molded PE**
- **Elimination of**
  - **Pallet**
  - **Corrugated Box**
  - **Plastic**

Wrapping



Preliminary Concept 4

Reusable Plastic Container That Uses a Disposable Plastic Liner

This container would be made out of rotation molded polyethylene with a disposable liner. It would have the following benefits:

- The supersack can be eliminated since the container acts as the supporting structure.

- The end user would have less hazardous waste since the PE liner takes up less volume than the super sack.

- The container is more space efficient than the current packaging.

- A pallet is integrated into the plastic container so the current wooden pallet can be eliminated.

- The corrugated cardboard box is eliminated since the plastic container becomes the only support ing structure.

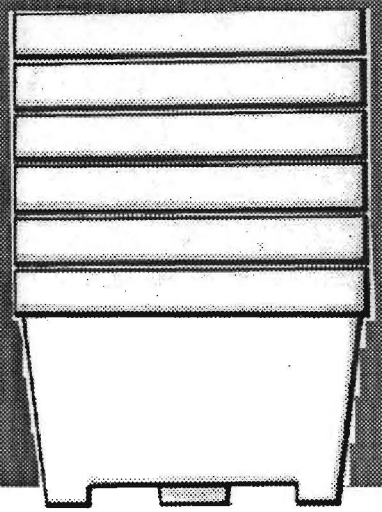
- Shrinkwrapping is eliminated since the plastic container locks in place when stacked.

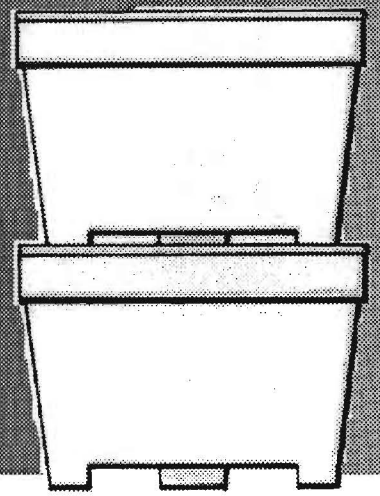
- The top aluminum frame can be eliminated because the container can be put directly on top of the feeder.

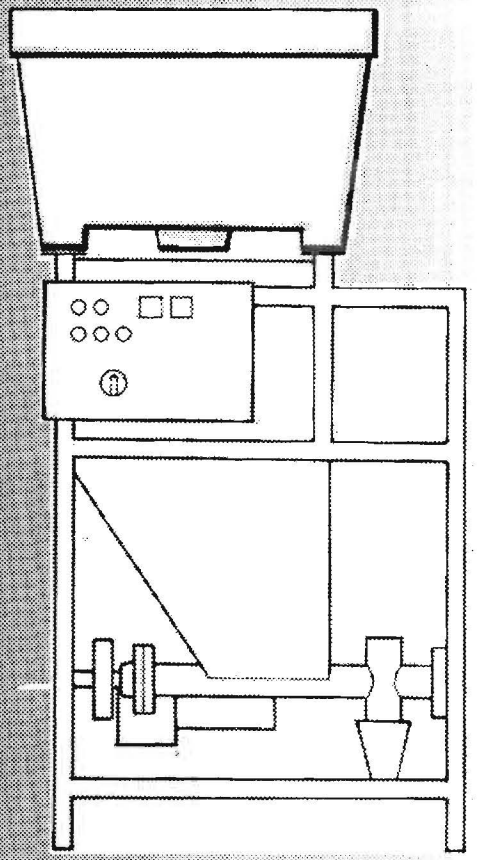
BioLab

Preliminary Concept 4
(continued)

- Stacks for Efficient Shipping
- Nests when Empty
- Eliminates Aluminum Frame







Preliminary Concept 4
(continued)

Problems introduced

Although the concept of the reusable plastic container solves a lot of problems, some new ones are introduced:

- Initial cost of the bins is an issue. Although the containers may be cheaper in the long run, the initial investment is substantial, approximately $250 -$300 per container.

- Return shipping of empty containers is an issue. This is an additional cost that does not exist with the current packaging.

- Tracking of containers is required to prevent the containers from being "lost" there has to be some sort of tracking system.

- The bromicide powder might not flow as well from the rigid container as it does from the deforming super sack. Some pulling an shaking of the liner as it empties may be necessary.

Conclusion

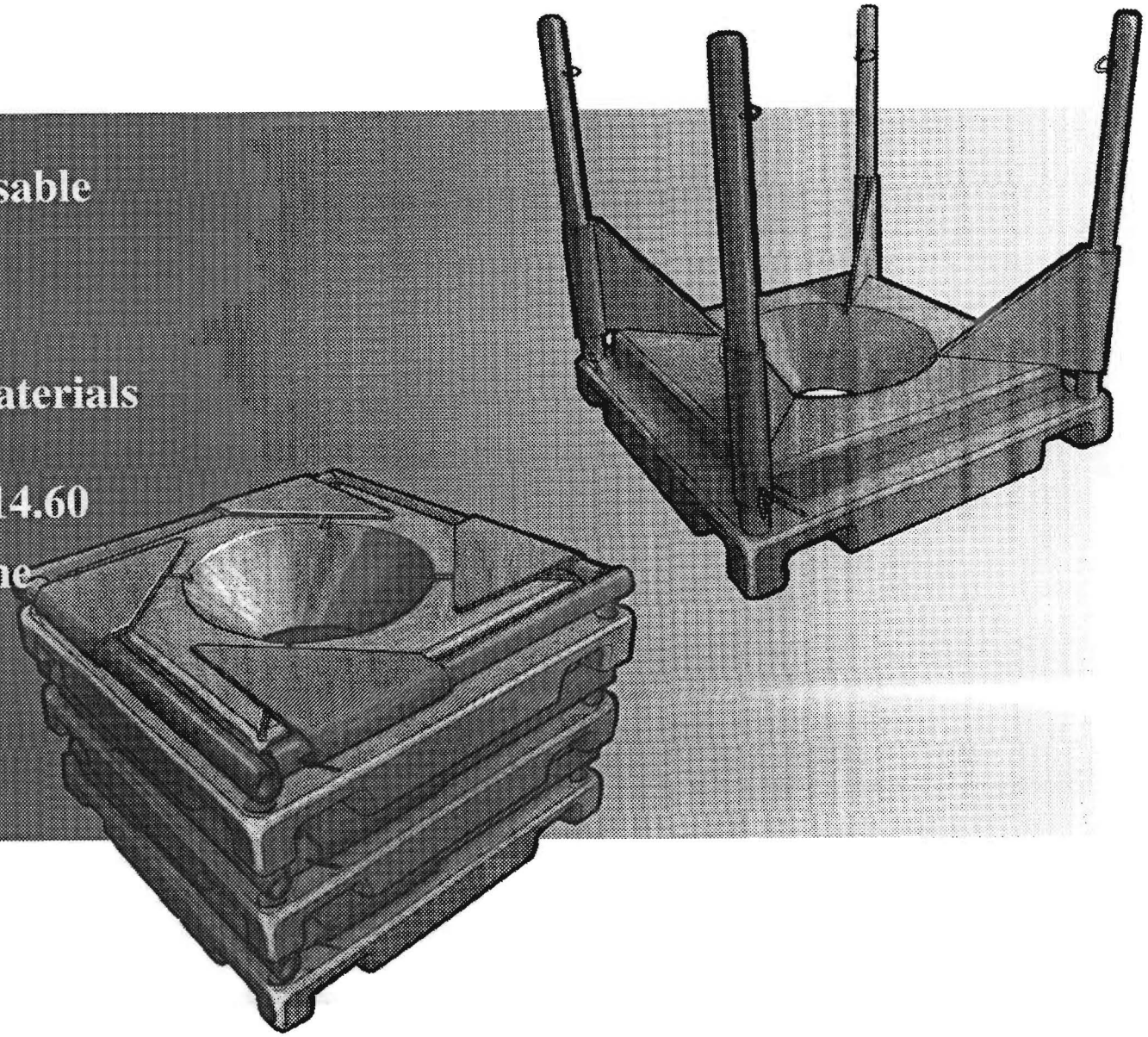
The reusable plastic container would not be a short-term solution because of the radical changes to the entire product life cycle. Product development would also be substantial and time consuming, but in the long run, it might be a very viable solution, especially considering the reduction in material use.

BioLab

Preliminary Concept 5

Reusable / Collapsable
Outer Container

- **Reduction of materials**
  - **Palette $8.82**
  - **Cardboard $14.60**
- **Faster setup time**



Preliminary Concept 5

Reusable/Collapsible Outer Container

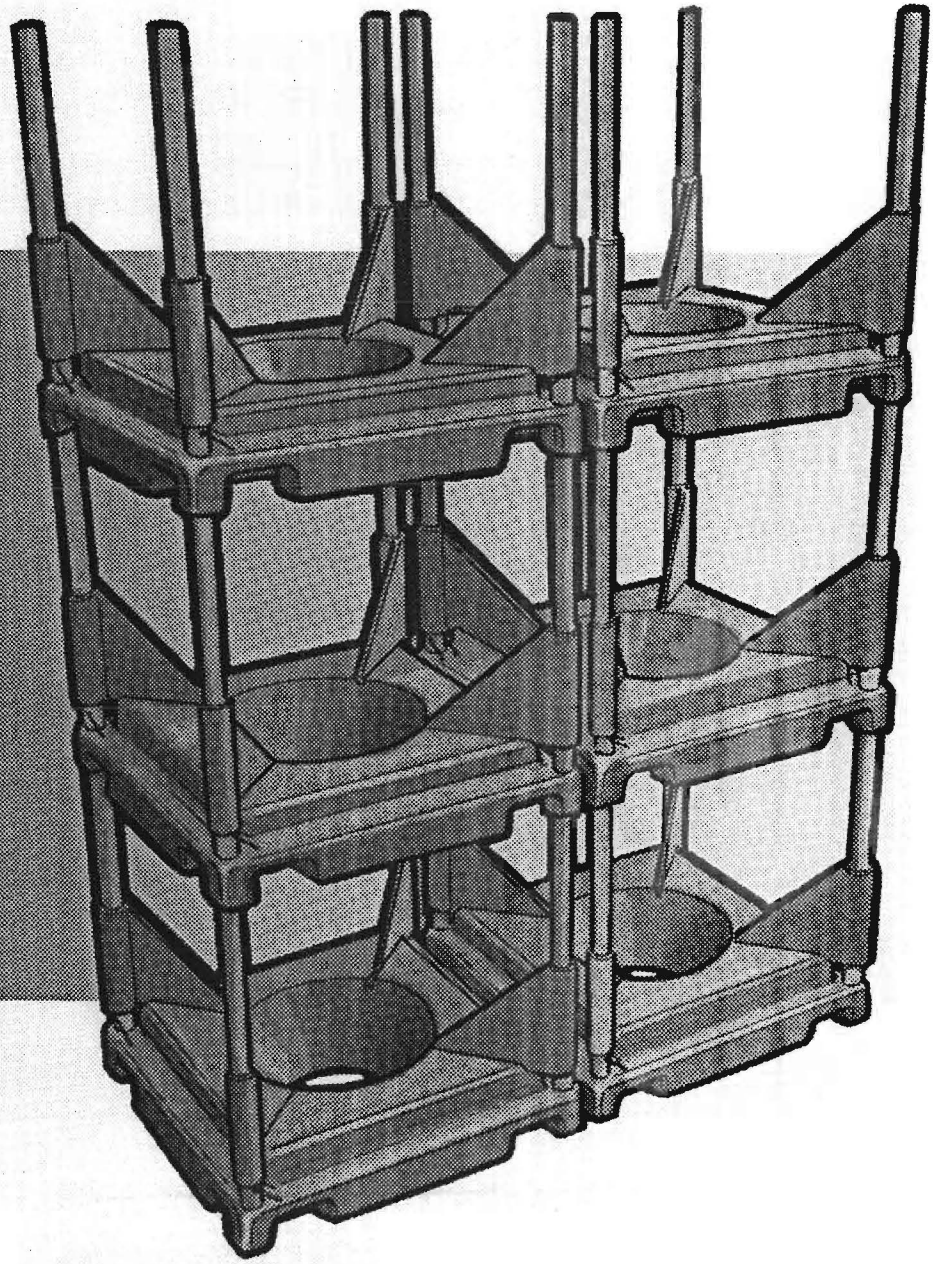
A reusable container that reduces the number of materials is proposed. By integrating the pallet into the structure and eliminating the cardboard box, there is a significant reduction in cost. The team has looked at creating a package that is user friendly to speed up the set-up time, and in turn, reduce labor cost.

BioLab

Preliminary Concept 5
(continued)

Reusable / Collapsable Outer Container

- Rotationally molded
- Secure stacking
- Stacks 3 wide in the truck



Preliminary Concept 5
(continued)

Stacking

Increasing the height a few inches allows the footprint to shrink. This will allow pallets to be stacked 3 wide instead of the current 2, thus increasing the total volume shipped by 50%. After the supersack has been dispensed, the container collapses to minimize shipping space, which will reduce shipping cost. The collapsable container should be easier to handle. In addition, the funnel-shaped base allows for an even distrubution of product to be dispensed.

DEVELOPED CONCEPTS

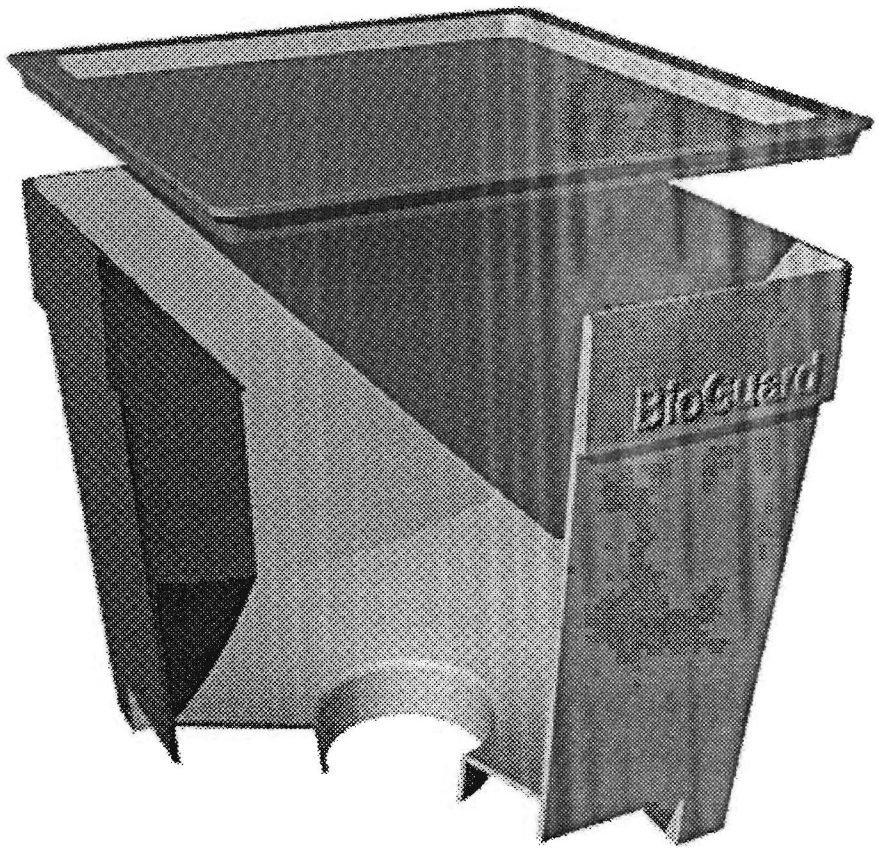
Introduction

After feedback on the preliminary concepts from Biolab, the team continued to work on packaging concepts. The following section represents the final concepts that the team envisioned. Both disposalble and reusable concepts are proposed.

BioLab

Concept 1 - Stackable Plastic Container

- Eliminates Supersac, uses a PE liner
- Integrated pallet
- Replaces aluminum frame



Concept 1

Stackable Plastic Container

Concept 1 is a reusable plastic container that uses a disposable plastic liner. The container can be put on top of the feeder and empty its contents trough a hole in the bottom.

Engineering

The container would be made out of rotationally molded polyethylene. The container would be single walled with a wall thickness of 1/4"-3/4".

If extra strength is necessary the container could either be made double walled or supporting ribs could be incorporated into a single walled design.

Areas that require further development is the funnel shaped base interior and hole size to allow approriate dispensing. Miscellaneous engineering specifications would be needed to determine the pallet slot locations and angle of the container for nesting when empty.

The lid would have to be double walled with ribs to be able to take the necessary stacking load. The lid could also be engineered to snap fit to the main container.

Costs

The die cost for both container and lid would run in the range of $16,000. Unit cost per container would be approximately $100 . This price will decrease slightly with increasing number of produced units. There would not be any additional assembly cost because of the simplicity of the container design. Liner price is in the range of $2 per unit.

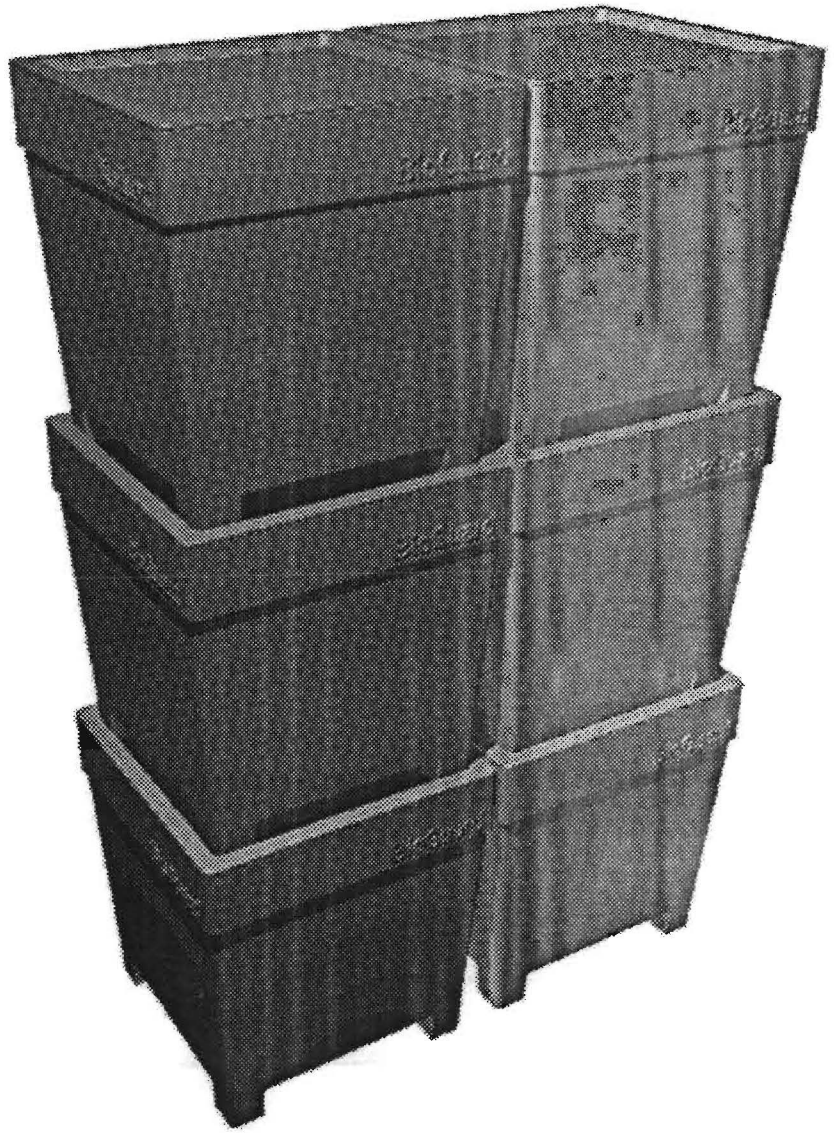
Life span

The typical for a Polyethylene container is 5-10 years, depending upon number of uses. Since a relatively non-intensive use can be assumed for these containers, the life span would be in the upper range.

BioLab

Concept 1 - Stackable Plastic Container

- Space efficient for shipping
- Eliminates cardboard boxes and plastic wrapping



Concept 1
(continued)

Advantages of concept

- The supersack can be eliminated since the container acts as the supporting structure.

- Less hazardous waste to dispose of for the end user since the PE liner is far less volumous than the super sack.

- The container is more space efficient than the current packaging.

- A pallet is integrated into the plastic container so that the current wooden pallet is eliminated.

- The corrugated cardboard box is eliminated since the plastic container becomes the only supporting structure.

- The plastic wrapping is eliminated since the plastic container locks in place when stacked. Also, the container does not need the moisture seal that the wrapping normally provides.

- Since the container can be put directly on top of the feeder, the top aluminum frame can be discarded.

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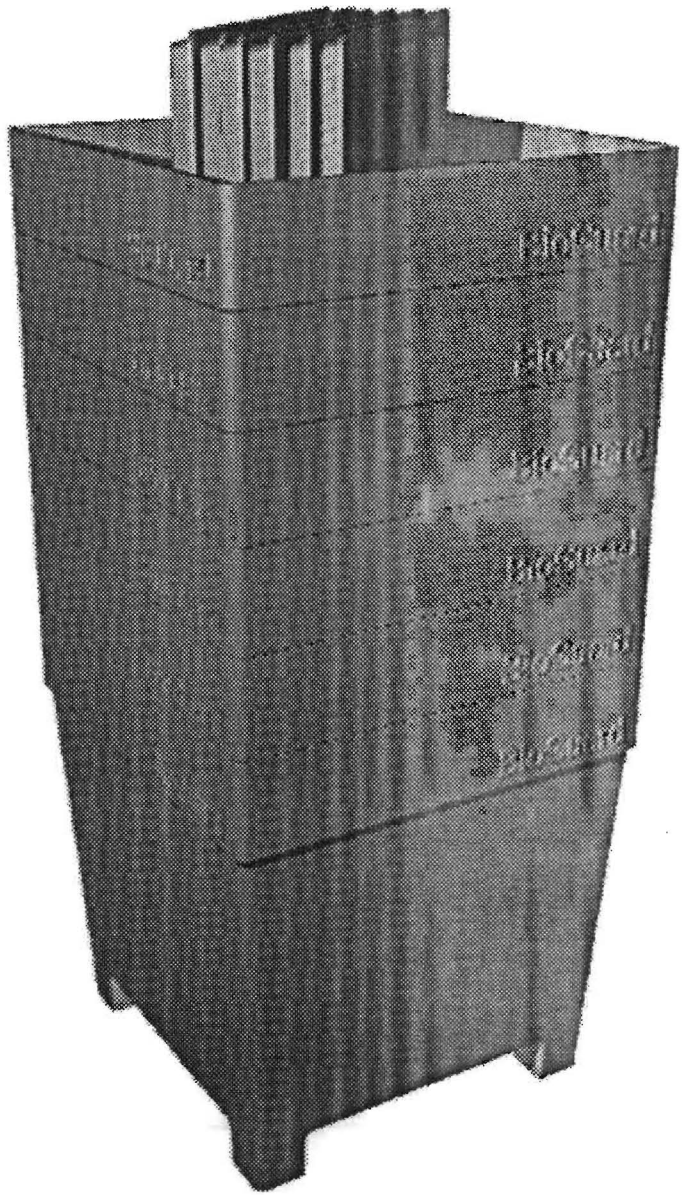
Concept 1 - Stackable Plastic Container

- Nests for efficient storage and return shipping
- Very durable
- Lifecycle estimate = 8 to 10 years
- Use of Supersac optional



Concept 1
(continued)

Problems introduced

Although the concept of the reusable plastic container solves a lot of problems, some new ones are also introduced:

- Initial cost of the bins. Although the containers may be cheaper in the long run, the initial investment is substantial.

- Return shipping of empty containers. This is an additional cost that does not exist with the current packaging.

- Tracking of containers. will be necessary to prevent the containers from being lost.

- The bromicide powder might not flow as well from the rigid container as it does from the deforming super sack. Some pulling an shaking of the liner as it empties may be necessary.

Conclusion

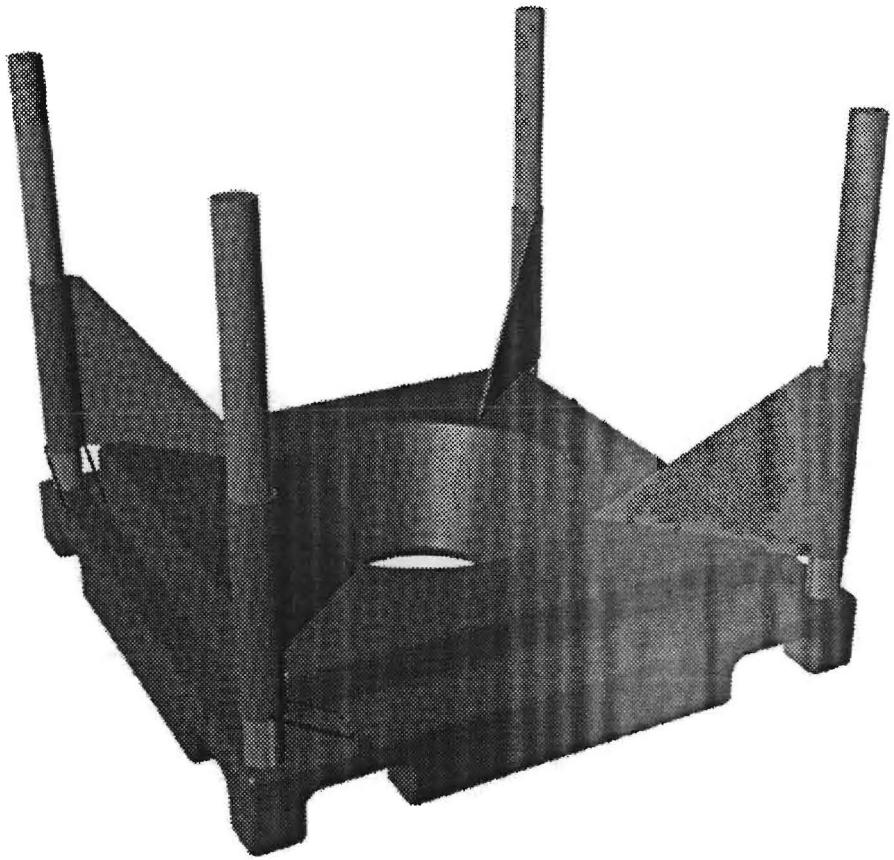
The reusable plastic container would not be a short term solution because of the radical changes to the entire product cycle. Product development would also be substantial and time consuming. The concept would work best with larger customers, since this distributor own its own trucks for supplying the end user. These trucks would have to pick up the empty containers from the end user and then store them centrally before full truckloads of containers could be sent back to the Great Lakes plant.

In the long run substantial savings should be possible with this concept compared to the current packaging. This is mainly because the supersack is eliminated in the concept.

BioLab

Concept 2a - Collapsible Container

- Reduces labor time
- Collapsible legs
- Integrated pallet



Concept 2a
(continued)

Collapsible Container

The colapsible plastic container has many advantages such as being more user friendly, dispensing the product more efficiently, and faster setup time. The produst also has cost advantages.
Re-usability and integrating the pallet into the container reduces the number of materials and the amount of corrugate and wood waste. Faster setup time and lower assembly time may reduce labor costs.

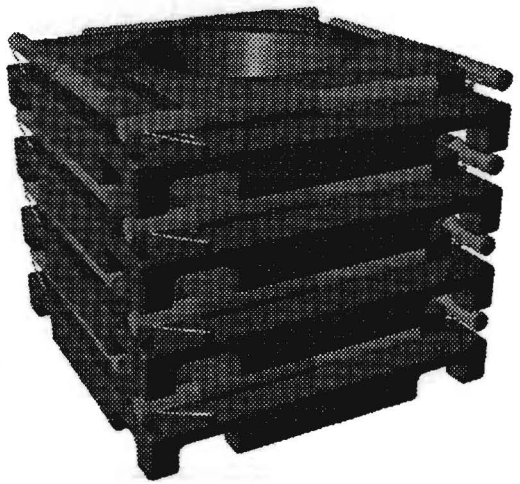
Limitations

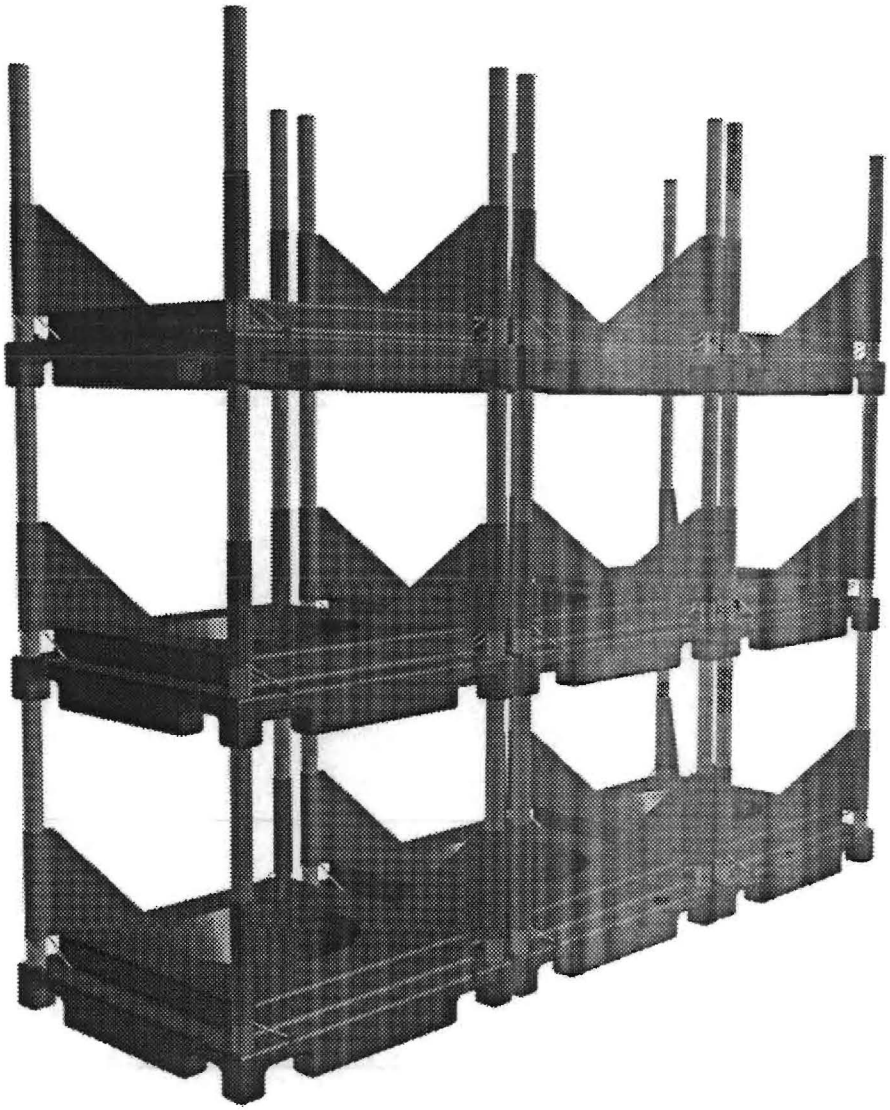
Concept 2a as it is shown, is not ecconomically feasble for several reasons. Having consulted with a local manufacturer regarding die costs and cost per unit, several comments and problems were brought to our attention regarding the original collapsible container. In particular three different processes are required to manufacture the container: rotation molding for the base, injection molding for the corner brackets, and extruding for the corner posts. In addition, the container requires a total of nine parts, with additional hardware and assembly required. There also is a concern for the stability of the corner posts when stacked. Stress or fatigue may occur in the posts directly above the corner bracket. Material is available to extrude a strong and dependable post, however, it is quite expensive. This collapsible concept is technically feasible, but due to the number or parts, processes, and assembly required, the manufacturer was unwilling to quote a specific price. Technically, manufacturing the container is possible, but a considerable amount of engineering and design would be required to integrate parts and lower the number of manufacturing processes, and in turn, reduce the number of dies required, lower costs, and minimize assembly time.

BioLab

Concept 2a - Collapsible Container

- Secure stacking
- Stacks 3 x 3
- Uses Supersac





Concept 2a
(continued)

Conclusion

The collapsible container has advantages in the areas of user friendlly, dispensing of the product, and faster setup time. The product also has cost advantages – reusability and Integrated pallet reduces the number of materials and the amount of waste. The faster setup time and quicker assembly time will reduce labor cost. Concept 2a as it stands now is not feasble for several reasons:

1- There needs to be more engineering and design work done to compliment the manufacturing process and the limitations.

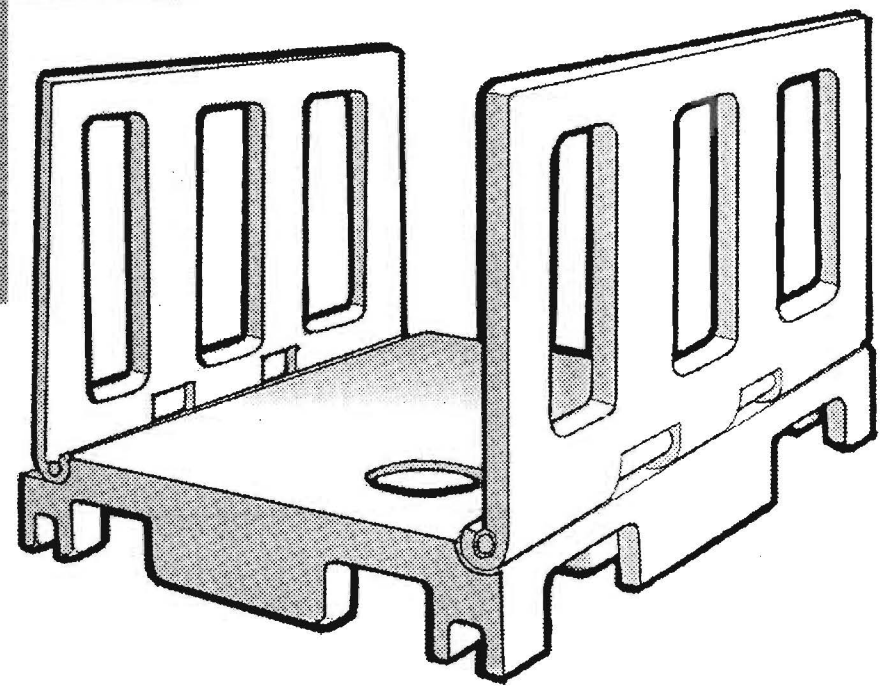
2- There needs to be an integration of parts to reduce the number of materials, the number of dies, mold costs, and assembly time.

Other concerns are that though the team was able to increase the number of units that fit on a truck, there remains the issue of the 330 lb vs. 500 lb supersack Also, the base needs to be redesigned so that the powdes and grannels stay within the footprint of the box.

BioLab

Concept 2b - Collapsible Container

- 3 HDPE parts, rotation molded
- 2 hinged side panels
  - Conduit tubing
  - Cotter pins
  - Unlocks when lifted upward
- Secure stacking (3 x 3)
- Lifecycle estimate = 4 to 8 years
- Uses Supersac



Concept 2b
(continued)

Collapsible Container

When further developing the collapsible concept, the team focused on reducing the total number of parts and processes to correct the possible area of fatigue or stress when the containers were stacked. Similar to Concept 2a, Concept 2b's function remains very much the same and has many of the same advantages. In addition, only three HDPE parts and some hardware make up the entire unit. The supersack is used in conjunction with the container and the straps may be looped around plastic hooks molded into the inside top of the side panels to keep the sack from sliding off. The loops are not shown in the drawing.

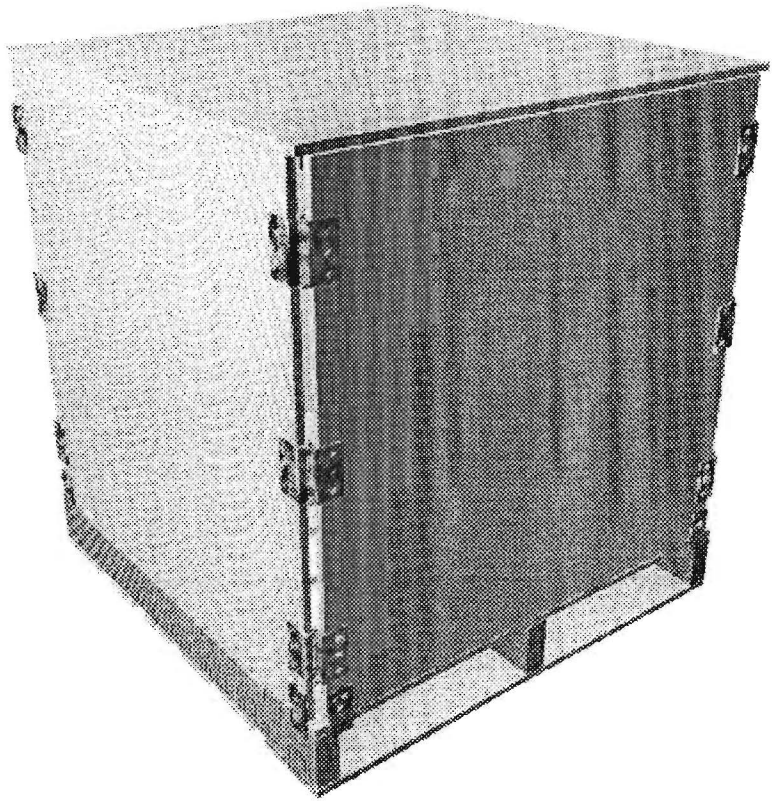
The side panels and the base are rotation molded and require three distinct molds. The left side panel is a few inches longer than the right and recessed down into the base, so that when collapsed, the right panel rests on top of the left. The panels do not rotate outward at any time and only rotate inward when each panel is lifted upward. When lifted upward, the hinging mechanism is released. The manufacturer has recommend not to engineer the hinge into the plastic. Many have attempted this without much success. Therefore, it was recommended to use an inexpensive conduit tubing with a few cotter pins to secure the panels in place. The top of the base is molded in a funnel shape so the material in the supersack may pour down through the hole. This funnel shape may allow the material to flow efficiently out of the sack.

Roughly 280 empty collapsed containers fit on a standard truck. The estimated life cycle of the collapsible container is 4 to 8 years depending on the amount of use. Over time, the hinging mechanism may wear and require repair or replacement. If pursued, the collapsible plastic container concept would further require a considerable amount of engineering. The hinging mechanism is one area that would require further development, and similar to concept 1, several more areas would require finalization with appropriate engineering specifications.

BioLab

Concept 3 - Collapsible Wooden Container

- Eliminates corrugate
- Renewable resource
- Durable and sturdy
- Lifecycle estimate
  4 to 8 years
- Uses Supersac



Concept 3

Colapsible Wooden Container

Similar to Concept 1 and 2, Concept 3's function remains very much the same, has many of the same advantages, and is used in conjunction with a supersack. The container is collapsible, reusable, and is being used in Florida, Europe, and other parts of the world. One specific design is currently being manufactured locally by Ridge Pallets in Forsyth, GA (404) 362-0022. The team was unable to acquire drawings or specifications on the current container so we designed the container from memory of having seen it before and through our design and engineering knowledge. The local manufacturer sells their containers to the Florida orange industry for approximately $72.00 per unit. If a wooden container was manufactured, according to the given dimensions and specifications, the cost per unit would roughly be the same. Eric Starlic with Ridge Pallets has stated that the containers are very sturdy and durable, and stack and collapse easily and very efficiently.

Concept 3
(continued)

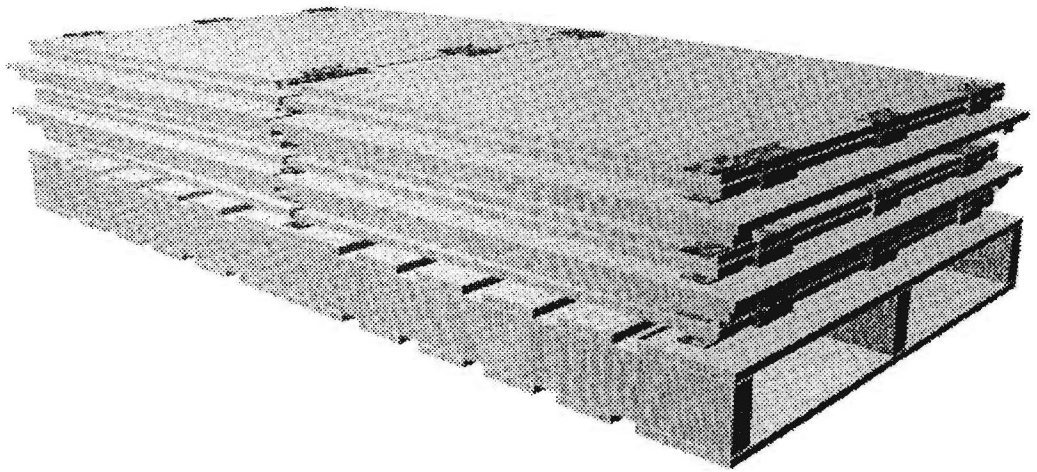
Container Specifications

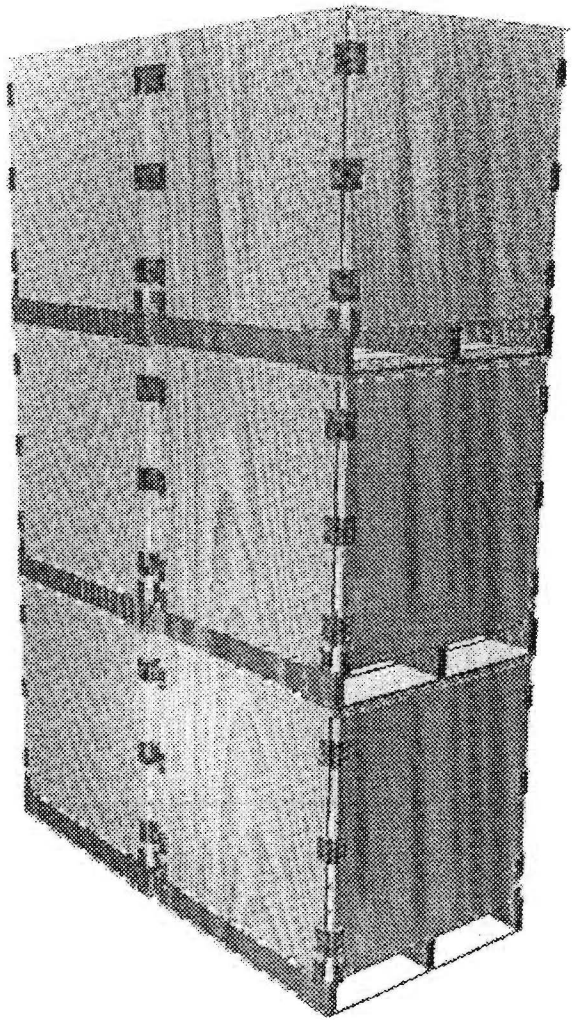
The required components are a standard 32" X 32" pallet, 4-32" X 28" X 1/2" plywood panels, 1 plywood lid and 2 slats, 12 hinges, 8 guide plates, bolts, and nutserts. The wood lid lifts off the side panels, and the wood panels lift off the pallet and collapses by all four panels having hinges. Only the side panels and lids would be shipped back to BioLab. With this in mind and the fact that the wood panels and lid require less space to stack than the plastic containers, nearly 380 empty collapsed containers may be shipped back in one truck load -- an additional 100 more containers than the plastic reusable. The estimated life cycle of the collapsible container is roughly 4 to 8 years depending on the amount of use. Over time, the hinges, guide plates or bolts may wear, rip out or move out of alignment and require repair or replacement. If pursued, the wooden collapsible container concept would require some additional engineering, but the effort is much less than the plastic containers and the cost would be included into the previous listed price per unit. Also, the wooden collapsible container, unlike the plastic containers, require no tooling, therefore die costs are non-existent. When evaluated further, the elimination of these additional up front costs may outweigh the slightly higher estimated life cycle of the stackable container.

BioLab

Concept 3 - Collapsible Wooden Container

- Secure stacking (3 x 3)
- Collapsible for ease of stacking





Concept 3
(continued)

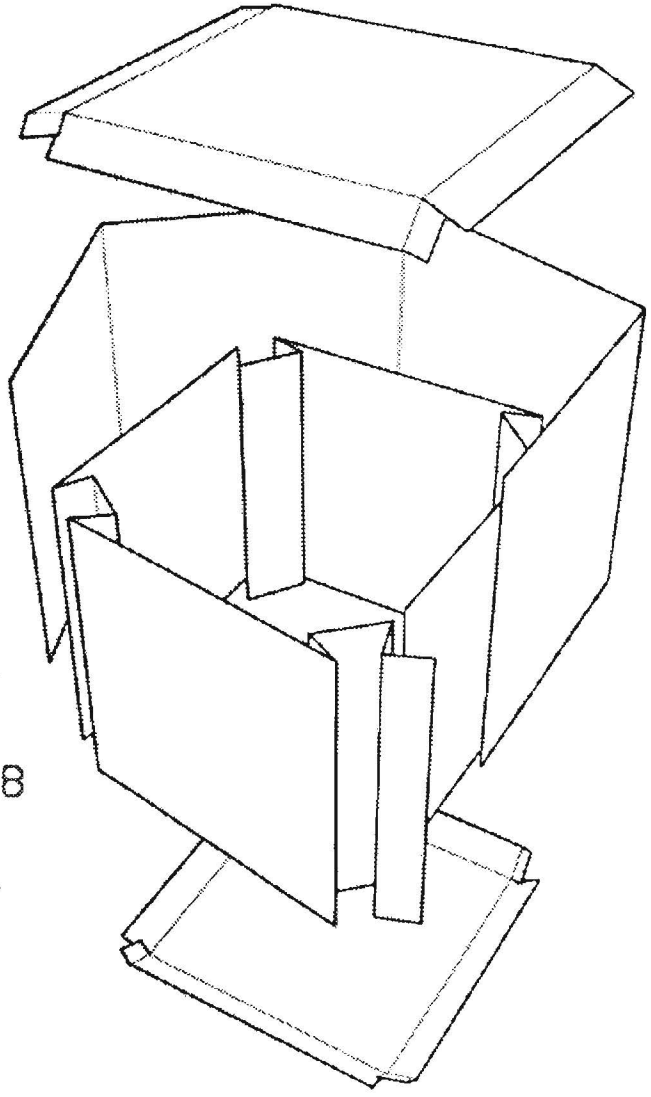
Shipping Considerations

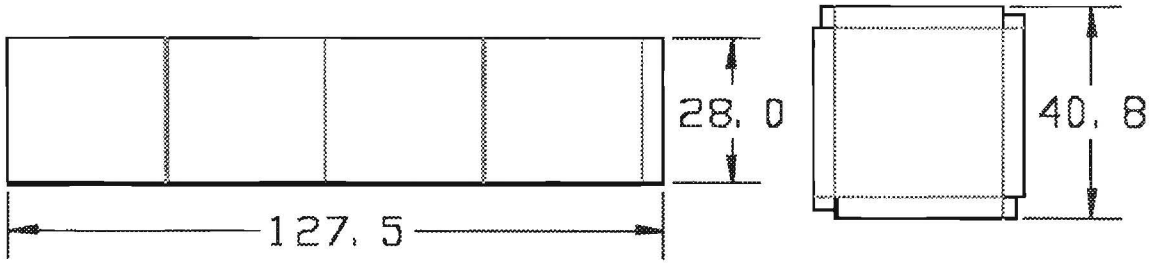
Each of the reusable plastic containers were designed to contain 500 lbs. of powder and roughly 757 lbs. of granules. Increasing the volume from 330 lbs. of powder to 500 lbs. was mentioned by Biolab project managers as a potential objective. Several distributors have made requests of this nature. Due to the supersack dimensions of 30" X 30" by 19", the group approached this objective by designing the outside dimension of the width and length of the reusable plastic containers at approximately 30.5" X 30.5". This would allow the container to fit into the frame where the supersack is now placed. By increasing the heighth of the inside of the container from 19" to approximately 28.5", volume would be incresed by the requested 44%. The overall approximate height of the container when considering the pallet is now integrated, is roughly 32". Three rows of three high and seventeen deep may now be shipped in a standard truck, thus increaseing the total containers shipped from 78 to roughly 140. Due to the DOT maximum shipping weight restriction, 140 500 lb. containers of powder and 140 577 lb. containers of granules may exceed the limit. However, by increasing the volume and reducing the overall dimensions of the container, the distributor may have two rows designated for full containers and one row for stacked or collapsed empty containers.

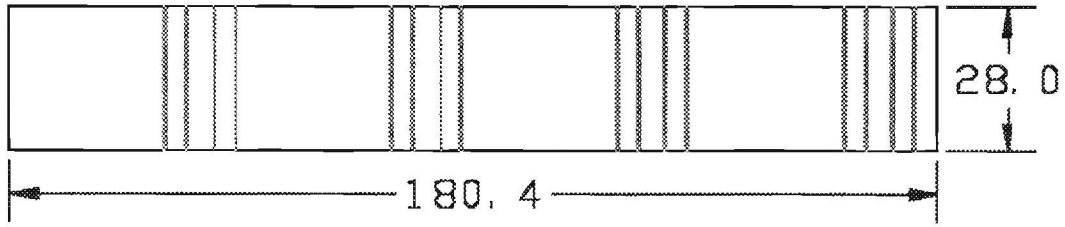
BioLab

Concept 4a - Disposable Corrugated Container

- Fewer parts
- Reduces "dead space"
- Double flute
- Reduces labor and number of parts and material

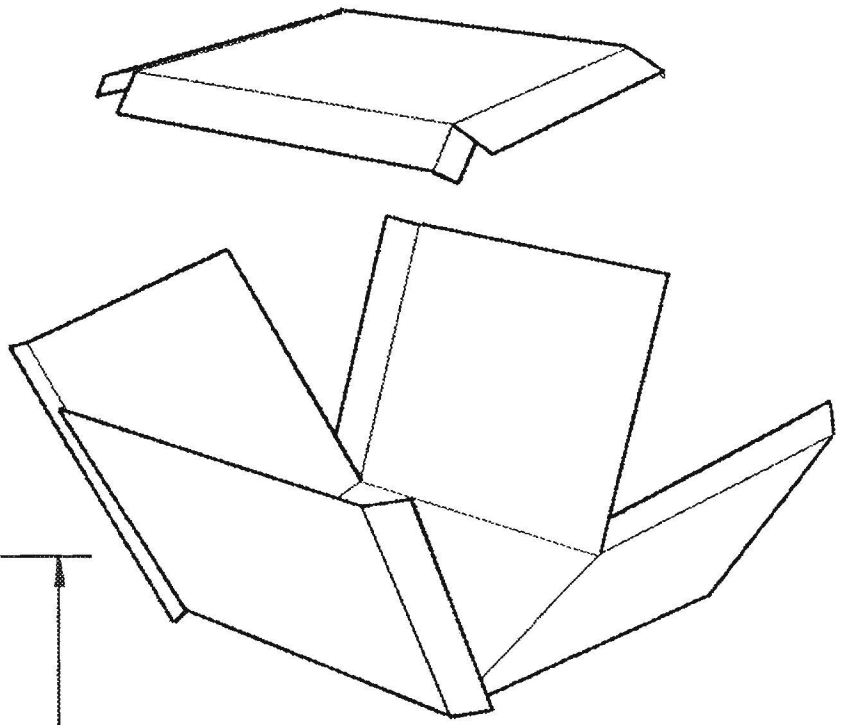


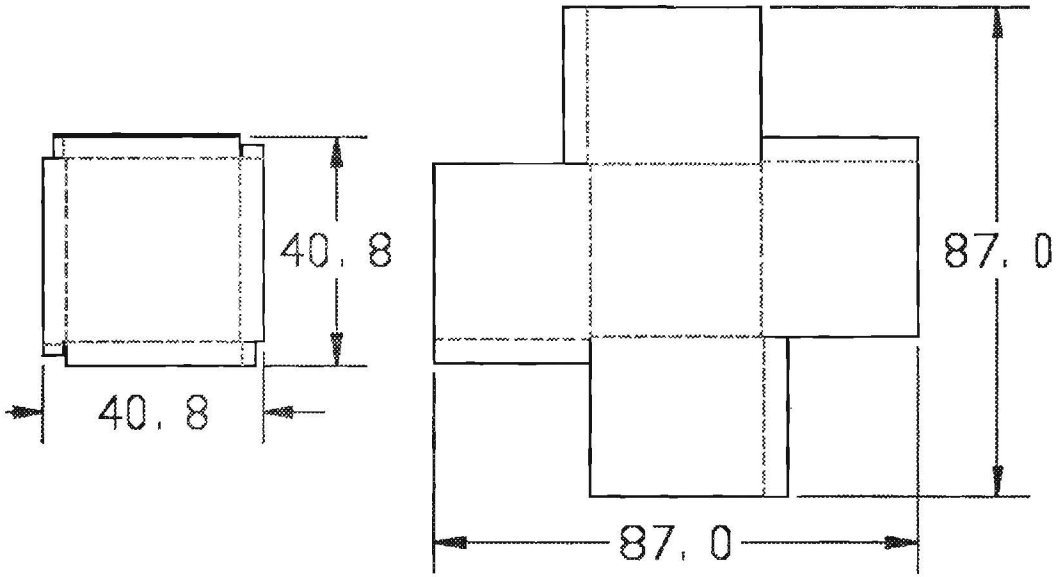




Concept 4b - Disposable Corrugated Container

- Reduces amount of material
- Triple flute
- Reduces "dead space"
- Reduces labor time
  (assembly of box)

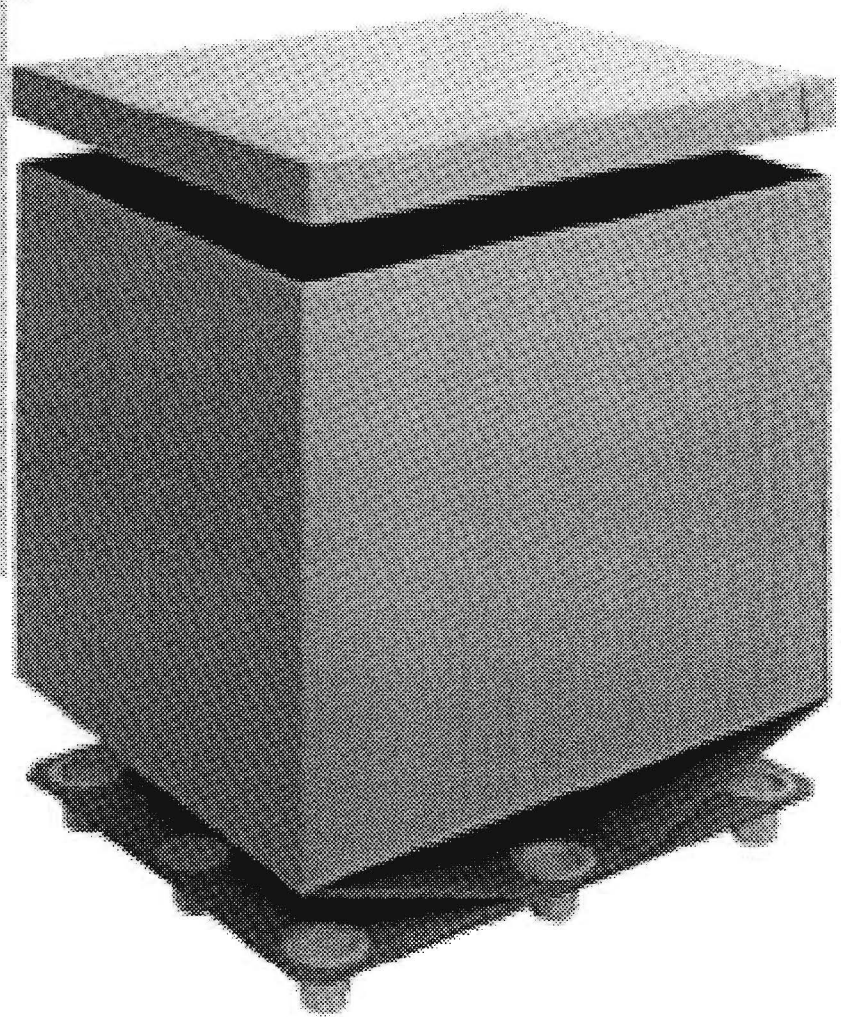




Concept 4d - Disposable Corrugated Pallet and Container

Corrugated cardboard pallet:

- Lightweight but strong
- Take up less storage space
- Less expensive than wooden pallet
- Easy to dispose of
- Can be custom sized



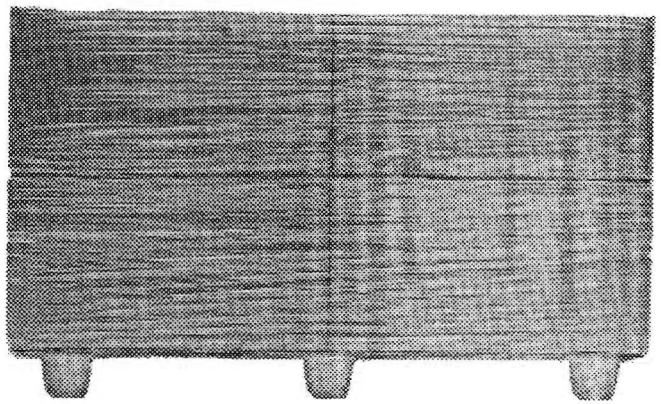
BioLab

Concept 4a

Upon conducting further research of corrugated pallets, the following information from Menasha Corporation was provided. Corrugated vs Wood

Corrugated Pallets

* Customized size
* 4 way entry
* 7 pounds
* 100 stacked pallets = 64"



A rough estimated cost per package is $10 to $12.

Several issues need to be investigated further between BioLab and Menasha Corporation if a business relationship is pursued. One issue is concerning the strength of the corrugated pallets holding the proper amount of weight. A second issue is regarding stacking the pallets securely three-high while being shipped.

Contact:

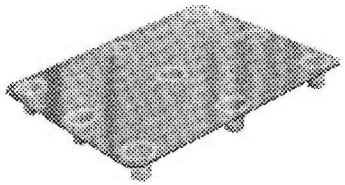
Brian Binder
Menasha Corporation
352 Sixth Street PO Box 259

Menasha WI 54952
800.558.5073 800.242.5077

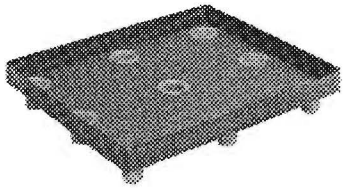
Corrugated Pallets

Several options for corrugated pallets are offered. The pallets are also customized to the needs of the user. One benefit of the pallets being customized is there is no custom die cut charge. Some options of customized pallets are:

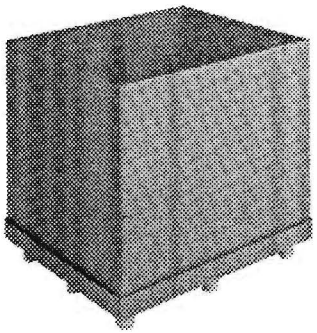
* Standard Pallet



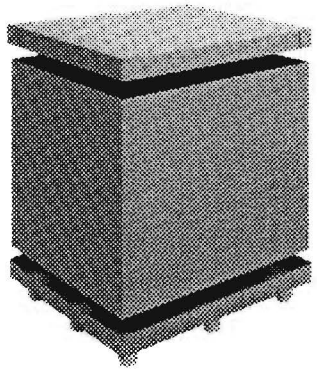
* Flanged Pallet

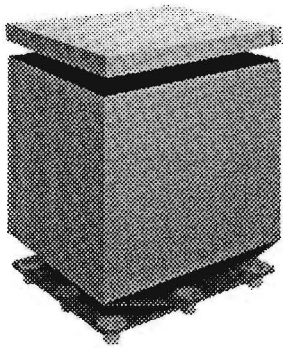


* Flanged Pallet and Corrugated Tube



* Flanged Pallet, Corrugated Tube and Cover





* Flanged Pallet, Half-slotted Container and Cover

BioLab

Reusable Container Specifications

Reusable Container Specifications

Concept 1

Components:	1 Base (Rotation Molded) 1 Lid (Rotation Molded)
Dimensions:	33" X 33" X 33"
Pallet Wall Thickness:	1/4"
Material:	PE Cross Link
Color:	Neutral Grey

Concept 2a

Components:	1 Base (Rotation Molded) 4 Corner Poles (Extruded ?) 4 Corner Braces (Inject Molded)
Dimensions:	33" X 33" X 33" with 1-2" taper
Wall Thickness:	3/16"
Corner Posts:	1.25" dia.
Material:	PE Cross Link
Color:	Neutral Grey

Concept 2b

Components:	1 Base Pallet (Rotation Molded) 1 Side Rt. (Rotation Molded) 1 Side Lt. (Rotation Molded)
Dimensions:	33" X 33" X 33"
Pallet Wall Thickness:	3/16"
2 Side Walls (overall thickness):	1.25"
Material:	PE Cross Link
Color:	Neutral Gray

Container Specifications

Concept 3

Components:	4 Walls (Plywood) 4 Corner Brackets (Steel) 8 Hinges 16 Bolts and Nutserts
Dimensions:	33" X 33" X 33"
Wall Thickness:	1/2"
Material:	Plywood
Pallet:	Cost: $8.00

Disposable Container Specifications

Concept 4a

Components:	4 pieces
Corrugate Wall Thickness:	Double Flute 3/16"

Concept 4b

Components:	2 pieces
Corrugate Wall Thickness:	Triple Flute 3/8"

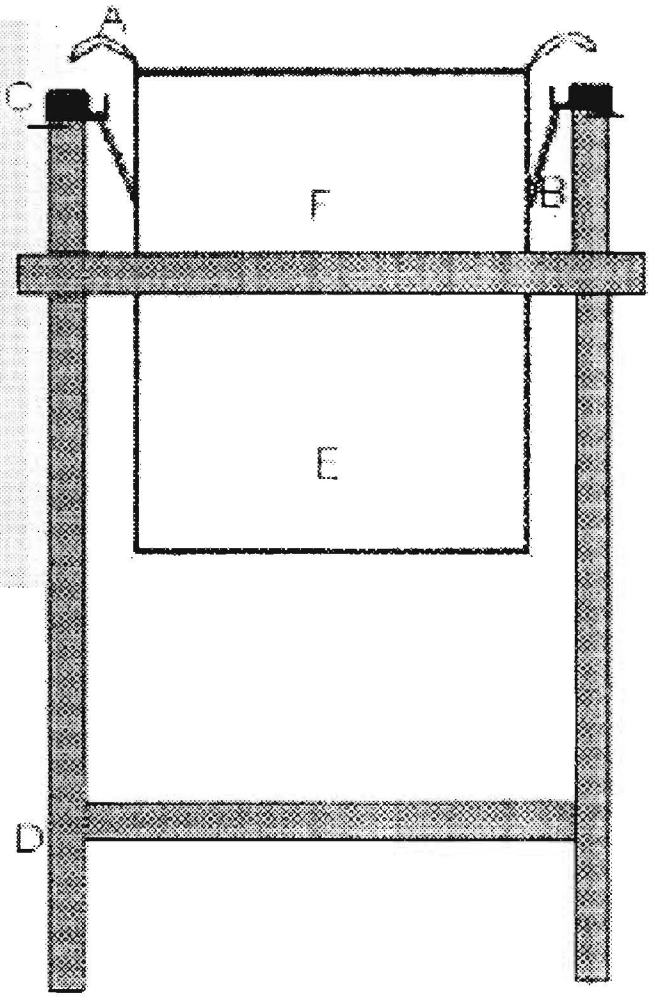
Concept 4c

Components:	1 piece
Corrugate Wall Thickness:	Triple Flute 3/8"

BioLab

Supersizing the Supersac

- Increase capacity of Supersac
- Compatible with current frame



Supersizing the Supersack

Making the supersack taller

The super sack can be made taller to allow for increased capacity without having to alter the current aluminum frame.

A. The upper loops enable the forklift to lift the super sac and lower it into position, either with, or without the aluminum crosspiece.

B. The lower loops are located at the same height as those on the current super sac. They attach to the hooks on the top corners of the aluminum frame. This allows the taller sac to hang at the same level as the smaller sac since there is no room for it to extend any lower within the frame.

C. A simple metal hook of some sort would be placed on the top of each of the four posts of the aluminum frame, where the circles of the crosspiece would normally rest. When the forklift lowers the bag into the frame using the upper loops, the lower loops would be placed into the hooks. The bag would then be lowered the rest of the way, leaving the bag supported by the lower loops in the hooks.

D. This is simply the current aluminum frame.

E. This is the supersack.

F. This shows the height of the current bag.

The purpose of making the bag taller is to increase the capacity, which is especially helpful in the case of powder. The aluminum crosspiece will fit into the upper loops of the taller bag, but when rested on the frame in the manner currently used, the bag would hang far to low. The hooks are an inexpensive way to hang the bag, simply by adding another set of loops when making the bag taller.

An alternative to the hooks is making an extension to the frame at either the top or the bottom. In doing so, you could do away with the lower straps on the taller supersack and use the crosspiece with the upper loops as is currently used. Making an extension to the frame, however, would be much more expensive than just sliding some hooks onto the posts.

BioLab

Reusable Containers - Cost Comparison

	Concept 1	Concept 2	Concept 3
Die Cost	$12,000.00	$16,000.00	
Units produced	2500	2500	
Die cost per unit	$4.80	$6.40	
Container cost (unit)	$99.00	$109.00	$80.00
Total unit cost	$103.80	$115.40	$80.00
Number of uses	10	10	10
Cost per use	$10.38	$11.54	$8.00
Disposable liner/sack	$2.00	$19.00	$19.00
Shipping (est.)	$10.00	$10.00	$10.00
Total cost per use	$22.38	$40.54	$37.00
Savings	**$19.62**	**$1.46**	**$5.00**

Other Considerations:

- Possible tax advantage (depreciation)
- Containers hold more product per unit
- Tracking and storage cost

Disposable Containers - Cost Comparison

	Concept A	Concept B	Concept C	Concept D
Estimated Cost	$12.50	$13.00	$10.00	$11.50 (Price includes pallet and container.)
Estimated Savings	$2.00	$2.00	$5.00	$12.00

Additional Information

- More space efficient packaging allows for an increase in shipping volume
- The maximum weight limit of 40.000 lbs must still be met

FINAL RECOMMENDATIONS

BioLab

Disposable versus Reusable

Disposable

* 50% more Bromine containers per truck
* No storage costs
* No return shipping costs
* No materials cleaning costs
* No package tracking costs
* Inexpensive $2 disposable cost
* Requires less materials than current materials

Reusable

* Ships as much or more per truck as disposable
* No pallets
* No cardboard or shrink wrap
* No Supersack frame required
* Environmentally friendly
* Sturdier
* Easier to use

Pros and Cons of Disposable and Reusable Packages

While examining the different types of product ideas, it is evident that there are areas where the disposable packaging concepts are the better choice while there are areas where the reusable packaging ideas would be more beneficial. The advantages provided by the disposable packaging lie mainly in the cost category; the advantages of the reusable packaging are in the areas of efficiency and environmental concerns.

The disposable packaging concepts offer a lower cost solution because they actually consume less material than the current packaging. The disposable packaging will eliminate storage costs due to the fact that, when finished, they are simply discarded. Disposal of these used packages only involves a small $2 fee. The redesigned disposable packages also are able to make better use of truck space for shipping purposes. Now, 33% more bromine sacks can fit on each freight carrier with the disposable concepts.

Reusable versus Disposable

Reusable packages are decidedly more efficient solutions that use far less materials than the disposable packages. As far as the shipping is concerned, with the reusable packages, there is no need for pallets or any cardboard or plastic wrap for packaging. These packages are also easier to use and require no cumbersome supersack frame on the bromine machines. Overall, the reusable packages are sturdier and easier to use which leads to higher levels of cost effective labor efficiency. There are also environmental advantages to using the reusable packages. BioLab could be labeled as a good corporate citizen by changing their packages so they are not constantly discarding supersack materials and packages. Like the disposable packages, the reusable packages offer the increased bromine per truck capability. However, the collapsible reusable concept can do this three by three stacking on the truck with 300 lb. containers, while the stackable concept can accomplish this same stacking with 500 lb. packages.

Comparing the two different types of solutions, disposable packages clearly involve less costs than reusable. There is no cost to ship the materials back to BioLab after use like there would be for the reusable packages. There would also be no cleaning costs like the reusable since the materials would simply be discarded after use. There would be no cost for tracking the disposable packages. Reusable packages would need to be tracked since they would eventually be returning to BioLab. Also, there would be storage costs for the extra reusable packages, a cost that would not be incurred for the disposable packages.

On the other side of this, there are plenty of advantages to using the reusable packages over the disposable concepts. The reusable packages require far less materials than the disposable packages and are much better for the environment than the disposable due to the decrease in wastes materials. The reusable packages are much easier to handle and do not require the use of the frame for the supersack, thus eliminating some equipment maintenance costs. Labor efficiency would increase with the reusable packages due to the elimination of pallet use and wrapping of the packages before shipping. Finally, although the reusable package would be more costly in the short term due to the new materials costs in building the reusable packages, there would be long term savings since there would be much less materials to purchase once the reusable packages had been constructed and used.

It can be seen that there are various purposes for using the different types of packaging concepts. If one were strictly looking for the lower cost solution, the clear choice in the short term would be the disposable package. However, if one were looking for the more efficient, better for the environment package with possible long term savings, then the obvious choice would be the reusable package.

BioLab

Cost Issues with Reusable Packaging

Shipping Costs

One of the concerns involved with the issue of a returnable package is the cost of shipping the package back to BioLab. With this concern in mind, we investigated the costs involved. We looked into four options; UPS, FedEx, long-haul less-than-load carriers, and a dedicated carrier. We made some assumptions regarding the amount of packages that would be returned and the distance that they would need to be sent. We assumed that the end customers used an average of 1.5 supersacks per week, resulting iin 6 per month, the average distance would be 600 miles (this is the distance from Atlanta to Detroit, Michigan), and customers would return the empty packages once each month. The packages could be stacked and placed into a box, a 32" x 32" x 65" box for the stackable concept and a 80" x 63" x 40" box for the collapsible concepts. The results of the four inquiries are as follows:

1. UPS - The maximum limitations for the box size mandated by UPS would not allow us to use their service. They have a maximum weight of 108 lbs. and a maximum girth (longest side plus two times the other two sides) of 130". The girth for the stackable concept is 193" and the girth for the collapsible concepts is 286". We are therefore well beyond their limitations.

2. FedEx - The cost of the shipment is based on the size of the box and the assumed maximum weight of the box, regardless of the actual weight of the box. The box that the stackable concept would be returned in is considered to weigh 343 lbs. and would cost $454 to ship 600 miles. For the collapsible concepts, the box is assumed to weigh 1040 lbs. and would cost $1379 to send 600 miles.

3. Long-Haul Less-Than-Load - These companies specialize in picking up loads that do not fill an entire truck and are, therefore, less than a full load. These companies charge per mile, based on the weight class of the box. We contacted Yellow Freight for an estimate. The box for the stackable concept is Class 150 and would cost $266.10 to ship 600 miles. The box collapsible concepts is larger and is therefore Class 250. This box would cost $496.32 for 600 miles.

4. The final inquiry was based on the assumption that some distributors own their trucks used for delivery. With this assumption, we can eliminate the cost of picking up the reusable package from the end customer. Instead, the delivery truck can pick up the packages to be returned when the products are dropped off. When the truck has made all of its deliveries, it would be full of returned packages. These packages could be taken back to the distributor for storage. When enough packages are accumulated to fill a freight truck (number of empty packages ranges from 294 to 500, depending on the concept), a full truck could be sent back to BioLab, costing approximately $2027.25 for 600 miles. This idea would work especially well for large distributors that have customers who consume large volumes.

BioLab

Additional Comments on Reusable Concepts

Although the concept of a reusable packaging system may appear as a viable solution, several problems do exist. These problems are listed as questions and statements below.

* Are return shipping cost as high as initial costs (the container takes the same amount of space to ship to the customer as it would to ship back to Biolab)?
* Do customers and distributors have enough available space to store and stock the containers until a certain number may be accumulated to be sent back?
* Should Biolab include a deposit into the package or not?
* Will BioLab's customers be willing to pay the extra cost?
* Cleaning the container is necessary prior to filling it up for another use. Since the container does incorporate a valve, cleaning is not required prior to shipping back to Biolab. All cleaning would be done at the manufacturing facility. Is this feasible?
* Ideally, only one packaging for both the powder and pellets would be best. Since the solid container may present a problem with the dispensing of power, either two different containers may be required. However, if the funnel with in the base of the container was steep enough, the problem of dispensing may be eliminated. In addition, the worker may no longer need to remain on the platform and punch the side. Is this feasible?

Increasing hazardous waste disposal costs and increased concern for landfilling are two strong drivers that may one day be determining factors in implementing this form of packaging. When shipping international, due to the fact that Biolab manufactures from one site, reusable containers would not be cost effective nor environmental sound due to the increased amount of energy required and fuel burned to ship the container back to the plant to be refilled, not to mention the water necessary to clean the container prior to reuse.

Reusable Concepts

When shipping domestically, the development and proper implementation of a reusable container may potentially lead to cost effectiveness and environmental soundness. A full Life Cycle Analysis (LCA) considering all factors of container reuse may be in order. Many consulting firms exist that specialize strictly in LCA. Electronic data bases and software have been developed and are currently being further evaluated and developed for problem solving of this magnitude. Below are listed several of these consulting firms:

* Franklin and Associates, Prairie Village, KS

* Jack Farko with Container Components (404)346-1458, a local Atlanta manufacturer specializing in plastic reusable concepts. The team acquired die costs and cost per unit for each container. In addition, many comments and recommendations were made regarding the potential manufacture of each plastic container.

*Eric Starlic with Ridge Pallets in Forsyth, GA (404) 362-0022, a pallet manufacturer specializing in wooden reusable concepts. The group acquired cost per unit in addition to several comments and recommendations regarding the potential manufacture of their container.

Internationally, the issue of packaging waste has been elevated. In fact, the European Community (EC) has been dealing with environmental regulations for nearly 20 years. Due to the relatively close proximity from country to country and a more dense space, the EC have been debating many regulations and policies on the disposing of waste in landfills, especially hazardous waste. Currently, Germany has in effect a pckaging take-back program, where the manufacturer takes back the packaging that the product arrived in. These packaging and product takeback legislation will increase to be much stronger drivers in the future.

BioLab

Tracking System

Should a reusable container be used, a successful tracking system will be required. It is important for Biolab to maintain up-to-date records of containers held by each distributor. The team suggests a tracking system using bar-codes similar to systems used by libraries and video-rental stores. Skandata has created bar-code systems that will allow Biolab and its distributors to track every container. Return of the reusable containers is vital to Biolab and the distributors. Therefore, the team suggests Skandata Tracking System in a Box.

This system provides everything needed for fast and easy implementation of traditional tracking applications in a single cost effective package. Skandata's Tracking System in a Box include: Skandata tracking application module of choice (assets, inventory, or items), Skandata SkanPack portable software, Skandata.ttf for bar code printing, portable data collection handheld terminal, and bar code laser scanner. The complete kit, equipment, and software cost only $1995.

Skandata Access Toolkit provides and enhances flexibility by attaching Skantrak tables and allowing full use of Access report, query, and form generation Wizards. The portable bar code data collection handheld terminal is used for physical inventory. The Skandata.ttf Code 39 TrueType font is for printing bar codes directly from Skantrak, WordPerfect, Word, Access, FoxPro, Excel, or any other Windows software.

This system is extremely easy to use and therefore Biolab employees and the distributors should not encounter difficulties while using Skandata. Express check in/out capabilities are provided for fast and easy processing of returns and moves. The system also allows for a review of current and history records for any container at any time, based on location, department, status, and virtually any imaginable criteria. Skandata provides state-of-the-art easy to use query by form. This feature provides the ability to generate desired queries or reports on users at any level.

Bar code systems allow Biolab and its distributors to accurately and easily track every container. The replacement cost of each reusable container will provide the motivation for the distributors to implement such systems. A bar code label will be placed on every container, and an employee at any level may scan this label with a handheld portable reader. The information will be downloaded into Biolab's database and can be easily retrieved. Such system is necessary to organize and keep track of the numerous containers distributed.

Final Recommendations

Long Term:

- Use reusable containers with the primary customer

Short term:

- Increase size of supersac
- Reduce amount of cardboard in packaging
- Make packaging assembly more labor effective
- Consider using the cardboard pallet / box